



Prediction of the indoor temperatures of an urban area with an in-time regression mapping approach

Author(s): Smargiassi A, Fournier M, Griot C, Baudouin Y, Kosatsky T
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Abstract:

Excess mortality has been noted during high ambient temperature episodes. During such episodes, individuals are not likely to be uniformly exposed to temperatures within cities. Exposure of individuals to high temperatures is likely to fluctuate with the micro-urban variation of outdoor temperatures (heat island effect) and with factors linked to building properties. In this paper, a GIS-based regression mapping approach is proposed to model urban spatial patterns of indoor temperatures in time, for all residential buildings of an urban area. In July 2005, the hourly indoor temperature was measured with data loggers for 31 consecutive days, concurrently in 75 dwellings in Montreal. The general estimating equation model (GEE) developed to predict indoor temperatures integrates temporal variability of outdoor temperatures (and their 24 h moving average), with geo-referenced determinants available for the entire city, such as surface temperatures at each site (from a satellite image) and building characteristics (from the Montreal Property Assessment database). The proportion of the variability of the indoor temperatures explained increases from 20%, using only outdoor temperatures, to 54% with the full model. Using this model, high-resolution maps of indoor temperatures can be provided across an entire urban area. The model developed adds a temporal dimension to similar regression mapping approaches used to estimate exposure for population health studies, based on spatial predictors, and can thus be used to predict exposure to indoor temperatures under various outdoor temperature scenarios. It is thus concluded that such a model might be used as a means of mapping indoor temperatures either to inform urban planning and housing strategies to mitigate the effects of climate change, to orient public health interventions, or as a basis for assessing exposure as part of epidemiological studies.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Indoor Environment, Temperature

Temperature: Fluctuations

Geographic Feature:

resource focuses on specific type of geography

Climate Change and Human Health Literature Portal

Urban

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Non-U.S. North America

Health Impact:

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Time Scale Unspecified